MSDS 7346
Cloud Computing

I. Welcome to MSDS 7346

WELCOME to MSDS 7346, Cloud Computing. The objective of this document is to acquaint you with the administration, procedures, and policies of this course. Save this document for future reference.

II. Description of Course Content

This course explores architectures for cloud computing and provides hands-on experience with virtualization technologies. Topics include cloud computing architectures such as infrastructure-as-a-service, platform-as-a-service, and software-as-a-service. Understand programming models for cloud computing and fundamentals of virtualization technologies that enable scalability.

From the Professor:

This course is designed to introduce students to exponentially growing cloud computing technologies. The emphasis will be on the fundamental topics including Virtualization, security, provisioning, and DevOps. This course is intended to be a hands-on class with students experimenting with current technologies that make cloud possible as well as understanding all as a service deployment model. In this course, we will also get into Big Data concepts and some of the Big Data technologies especially Hadoop ecosystems.

III. A/Synchronous Sessions

Synchronous class sessions occur weekly during the term. These sessions will consist of discussions, problem-solving, and quizzes based on the asynchronous material. Synchronous sessions will be more discussion vs. presentation.

IV. Course Prerequisite

A student taking MSDS 7346 must be enrolled in the DataScience@SMU program. All students are assumed to have basic programming skills. This is a hands-on course that includes programming and working with virtualization technologies, Hadoop, and Public Cloud.

V. Required Textbook and Other Course Material

There is no specific textbook for this class. Cloud is continuously changing and no one textbook covers everything that we want to discuss and experiment with. We will use both industry and research papers during the course. Students are also expected to do their research. Reading material will be assigned about the topics that we will discuss as well as for weekly homework.

VI. Course Topic Summary

Table I lists the basic topics covered during each week of this course. Additional readings may be given during the course.

TABLE I
Topic Summary for Each Week of Course

Week	Unit Number	Topic
1	1	Whys and Whats of Cloud
2	2	Cloud Technologies
3	3	Cloud Services
4	4	Security
5	5	RDBMS
6	6	NoSQL
7	-	Midterm
8	8	Hadoop
9	9	Hadoop II
10	10	Hadoop Projects and Cloud
11	11	Big Data Project (No Video)
12	12	DevOps
13	13	Advanced DB Features
14	-	Final Project Presentations
15	-	Final Exam

1) *Whys and Whats of Cloud* – This week we will explore the fundamentals of cloud, taking a brief look at why cloud exists, different service types, deployment models, benefits of cloud, high-level overview of cloud technologies, and overview of cloud players.
   The primary learning objectives for this week are
   - to understand what is cloud
   - to understand the basic requirements for a cloud and
   - to understand different deployment models
2) *Cloud Technologies* – This week we will discuss technologies that make cloud possible. One such technology is virtualization. We will discuss different types of virtualization, how does virtualization fuel cloud computing, types of hypervisors, review some of the hypervisors available today.
3) *Cloud Services* – This week we will discuss both public and private cloud. We will get in the details of infrastructure and database cloud services.
4) *Security* – This week we will review key concepts of cloud security, database security, and cloud access security broker. Security ranges from liability to strength of moving a workload from on-premises to the cloud.
5) *RDBMS* – This week is a review of RDBMS. We will quickly go through all the concepts of RDBMS. The purpose is a refresher for concepts.
6) *NoSQL* – 1) This week we start to get into the Big Data concept, we understand what is Big Data, NoSQL, and discuss document databases.

7) *Midterm Exam*
8) *Hadoop* – Starting this week and for next two weeks we will cover Hadoop and its ecosystem. This week our focus will be around HDFS and HBase.
9) *Hadoop II* – This week is a continuation of last week where we will get into the details of the MapReduce architecture as well as discuss YARN.
10) *Hadoop Projects and Cloud* – This week we will discuss data access components of Hadoop ecosystem, and we will get into the details of Pig, Hive, and Spark.
11) *Big Data Project - No Video*
12) *DevOps* – This week we will discuss the how the product development is changing with more iterative development model. We will get into the details of microservices, containers, and talk about overall DevOps.
13) *Advanced DB Features* – This week we will discuss advancements that are taking place in databases. We will talk about features such as multi-tenancy, sharding, and in-memory.
14) *Final Project Presentations*
15) *Final Exam*

VII. Course Assignments

Table II lists the tentative due dates for each of different assignments during the term. Each homework is due before the synchronous session, as we would review this during the synchronous session. The term project is a team project that spans the duration of the entire course. The first deliverable of the project is coming up with the topic and assimilating the team. Each team can have up to two to three people, and this is due Week 4. The second deliverable is the first draft of the paper. It is intended to be a status check during the middle of the term. Last two deliverable are the final paper followed by student presentations last week of the class.

TABLE II
Weekly Assignments Due Dates

Week	HW Due	Mini Project Due	Term Project Due
1	Home Work 1	-	-
2	Home Work 2	Mini Project 1	-
3	Home Work 3	-	-
4	Home Work 4	Mini Project 2	Project Proposal
5	Home Work 5	-	-
6	Home Work 6	Mini Project 3	-
7	-	Midterm	-
8	Home Work 7	-	First Draft Paper
9	Home Work 8	Mini Project 4	-
10	Home Work 9	-	-
11	-	-	-
12	Home Work 10	Mini Project 5	-
13	Home Work 11	-	Final Paper
14	-	-	Presentations
15	-	-	Final Exam

VIII. Student Learning Outcomes

This course provides an introduction to cloud computing and virtualization. The primary goal of this course is to teach students the foundational concepts and technologies that make up cloud computing and virtualization as well as understanding Big Data concepts and Hadoop ecosystem. The primary learning outcomes for this course are:

1) Understanding of virtualization concepts
2) Ability to work with different hypervisors and how virtualization is used in cloud computing
3) An understanding of the fundamental issues involved in designing and using cloud
4) Understanding Big Data, andthe essential characteristics
5) Basic understanding of Hadoop ecosystem

The general learning outcomes for the department degree programs are supported within this course. Through the various activities associated with this course, we will, to a greater or lesser degree, achieve the following departmental learning outcomes:

1) An ability to apply knowledge of mathematics, science, and engineering to software and hardware design problems.
2) An ability to design and conduct experiments and to analyze and interpret data related to software and hardware design solutions.
3) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4) An ability to function on multidisciplinary teams using current computer engineering tools and technologies.
5) An ability to identify, formulate, and solve engineering problems based on a fundamental understanding of concepts of computer engineering topics.
6) An understanding of personal, professional, and ethical responsibility.
7) An ability to communicate effectively both in an oral and written form.
8) The broad liberal arts education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
9) Recognition of the need for, and an ability to engage, in lifelong learning.
10) Knowledge of contemporary issues in computer engineering.
11) An ability to use the techniques, skills, and modern engineering tools necessary for computer engineering practice.

IX. Description of Course Procedures and Policies

This course, like all courses, has a number of policies and procedures that students should understand and follow if appropriate. This section lists some of the more important policies and procedures that students must follow. Additional policies and procedures may be given by the instructor.

A. Grading Policy

This course consists of weekly asynchronous teaching material, once weekly synchronous sessions, quizzes, homework assignments, one midterm exam, a final exam, and a term

project. It is expected that not all students will earn an A letter grade for this course.

The final grade for the course will be calculated on the bases of the earned cumulative percentage and the grade received for each of the components of the cumulative percentage. This course is not graded on a curve. The required cumulative percentage needed to earn each letter grade is given in table III. The instructor reserves the right to lower these standards for the benefits of the students if such a change is warranted.

TABLE III
CUMULATIVE PERCENTAGE REQUIRED TO EARN EACH LETTER GRADE

Cumulative Percentage	Earned Grade
100 – 99	A+
98 – 92	A
91 – 90	A-
89 – 88	B+
87 – 82	B
81 – 80	B-
79 – 78	C+
77 – 72	C
71 – 70	C-
69 – 68	D+
67 – 62	D
61 – 60	D-
< 60	F*

The cumulative percentage for the course is determined by the components with their corresponding percentages defined in table IV.

TABLE IV
COMPONENTS AND WEIGHTINGS OF THE CUMULATIVE PERCENTAGE

Percentage of Cumulative Percentage	Component
10%	Weekly Homework
5%	In-Class Participation and Labs
25%	Mini Projects
30%	Term Project
15%	Midterm
15%	Final Exam

*You will receive a percentage grade for each component. If you earn less than 60 percent in any one of these components, you will receive a final grade of F for this course. This means that you must perform the term project to at least a 60 percent (grade of D-) level of proficiency, you must earn at least 60 percent on the midterm exam and on the final exam, and you must earn at least a 60 percent for your homework assignments and quizzes.

B. Grade Grievance Policy

Students are responsible for saving all graded materials as evidence in case of a discrepancy with the assigned grades. Students are responsible for ensuring that all grades are correctly reflected on the grade store.

Refer to the university catalogue for the university policy and process for grade grievances.

C. Attendance Policy

Attendance of the synchronous session in this course is mandatory. We will review homework that requires participation from each student. If it is necessary to skip a class please inform instructor ahead of time. Students with an unexcused absence will receive a grade of zero (0) for the participation grade for any missed day. Students with an excused absence will receive a grade equal to the average of the grades received by students who attended the missed lecture session.

D. Assignment Policy

Homework assignments will be performed individually unless otherwise clearly stated. Each student must hand in his/her assignment. If you work on any assignment with other people, you must indicate on your handed-in solution the names of all people with whom you worked. Identical and suspiciously similar homework papers will receive a grade of zero if the collaboration list on each of the homework papers does not include the authors of the identical or suspiciously similar homework papers.

To receive full credit, all directions must be followed. It is therefore important to read the written directions on the homework assignment and listen and follow any oral directions given by the instructor.

All assignments submitted after the deadline will receive a 50 percent reduction in the earned grade for that assignment. Homework is reviewed for answers each week in the synchronous class, so no late submissions are accepted.

E. Electronic Communication Policy

All communications with the professor should be made in person. When that is not possible, then communication should be attempted by calling or texting his telephone number.

All communications with the teaching assistants for the course (if there are any teaching assistants) should be made in person. When that is not possible, then email.

It is the student's responsibility to ensure that all communications from the student to either the professor or the teaching assistants is received, acknowledged, and, when appropriate, acted upon in a timely manner. Simply sending an email or text or leaving a voicemail does not guarantee that it has been received or acted upon.

F. Drop Policy

Refer to the university drop policy for a complete description.

G. Americans With Disabilities Act

Disability Accommodations: Students needing academic accommodations for a disability must first register with Disability Accommodations & Success Strategies (DASS). Students can call 214-768-1470 or visit http://www.smu.edu/Provost/ALEC/DASS to begin the process. Once registered, students should then schedule an appointment with the professor as early in the semester as possible, present a DASS Accommodation Letter, and make appropriate arrangements. Please note that accommodations are not retroactive and require advance notice to implement.

H. Religious Observance

Religiously observant students wishing to be absent on holidays that require missing class should notify their professors in writing at the beginning of the semester, and should discuss with them, in advance, acceptable ways of making up any work missed because of the absence. (See University Policy No. 1.9.)

I. Excused Absences for University Extracurricular Activities

Students participating in an officially sanctioned, scheduled University extracurricular activity should be given the opportunity to make up class assignments or other graded assignments missed as a result of their participation. It is the responsibility of the student to make arrangements with the instructor prior to any missed scheduled examination or other missed assignment for making up the work. (University Undergraduate Catalogue).

X. Academic Integrity

It is the philosophy of Southern Methodist University that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University.

Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.

Students caught being academically dishonest shall receive a grade of F for this course.